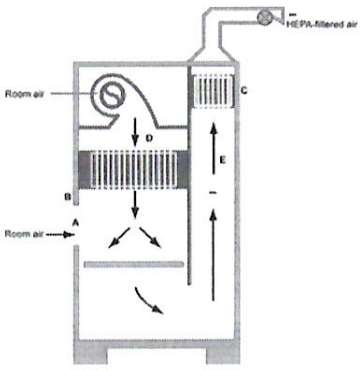

FIGURE 3. Class II, Type B2 biological safety cabinet
Legend: (A) front opening, (B) sash, (C) exhaust HEPA filter, (D) supply HEPA filter, (E) negative pressure exhaust plenum. *Note:* The carbon filter in the exhaust system is not shown. The cabinet exhaust needs to be hard-connected to the building exhaust system. (*Source:* CDC 2009)

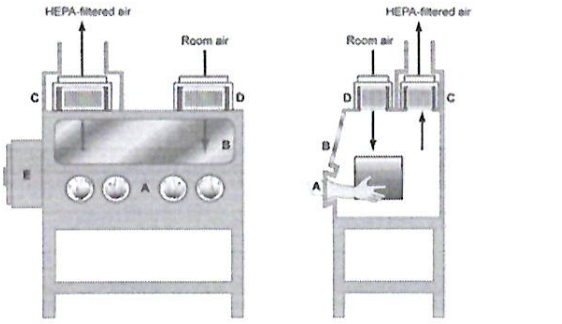

FIGURE 4. Class III biological safety cabinet
Legend: (A) glove ports with O-ring for attaching arm-length gloves to cabinet, (B) sash, (C) exhaust HEPA filter, (D) supply HEPA filter, (E) double-ended autoclave or pass-through box. *Note:* A chemical dunk tank may be installed, which would be located beneath the work surface of the BSC with access from above. The cabinet exhaust needs to be hard-connected to an exhaust system where the fan is generally separate from the exhaust fans of the facility's ventialtion system. The exhaust air must be double HEPA-filtered or HEPA-filtered and incinerated. (*Source:* CDC 2009)

The Class III biological safety cabinet offers the maximum amount of protection for the product, worker, and outside environment. The inside of a Class III BSC may be thought of as totally isolated from the outside environment. Many safety professionals would be familiar with a similar protective device termed a *glove box*. Incoming air is HEPA-filtered, and the contained product has no direct connection outside of the BSC. Figure 4 depicts the Class III BSC. The Class III cabinet is normally found only in the highest level of biological agent containment (e.g., BSL-4). The exhausted air is HEPA-filtered when leaving the unit. Generally, the air is also HEPA-filtered a second time prior to entering the external exhaust fan.

The prudent safety professional also encourages routine testing of primary safety devices such as BSCs. The primary standard for testing BSCs is the National Sanitation Foundations Standard 49 (NSF 2002). This standard is commonly used to evaluate and test the operation of *biohazard cabinetry*. It also specifies training necessary for individuals to conduct assessment or certifications of BSCs.

Training

Employee training encompasses a primary focus of the safety professional for biological hazards. Specific biological safety training is *risk-based* in accordance with the BMBL (CDC 2009). A general rule of thumb is that higher levels of containment dictate additional biological safety training. The frequency of refresher training is also based on the selected level of containment. Training for laboratory staff is based on assumed knowledge and competency of safe microbiological practices.

The following are abridged topics for biological safety training courses (NRC 1989):

1. ***Aseptic techniques:*** Fundamental microbiological techniques require laboratory techniques to prevent cross-contamination. The use of aseptic (or contamination-free) techniques is crucial when propagating infectious substances.
2. ***Laboratory and personnel hygiene:*** A review of historical accidents and exposures shows that failed adherence to good laboratory practices and poor hygiene habits played an important role in laboratory-acquired diseases. Training must encourage safe behavior that is congruent with OSHA regulations, especially in occupations where employees are exposed to bloodborne pathogens (OSHA 2001).
3. ***Laboratory safety practices:*** Laboratory safety practices generally involve the application of